

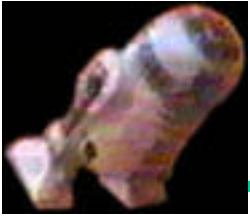
Perspectives on Offsite Analysis: The Grid and CDF

ICRB

Rick St. Denis - Glasgow University

Rob Kennedy-FNAL

For the CDF DH group



Outline



- CDF DH Goals
- The CDF DH Trident:
SAM/JIM/dCAF
- What can we do now?
- What can we do by the end of 2003?
JIM project
- What can we do in the future?
SAM/Grid Fusion
- What can other institutes do?



CDF DH Goals



- Offsite Computing
- MC Production
- Parallel Analysis
- User Metadata access
- Uniform access to data: tape and disk

20 May 2003



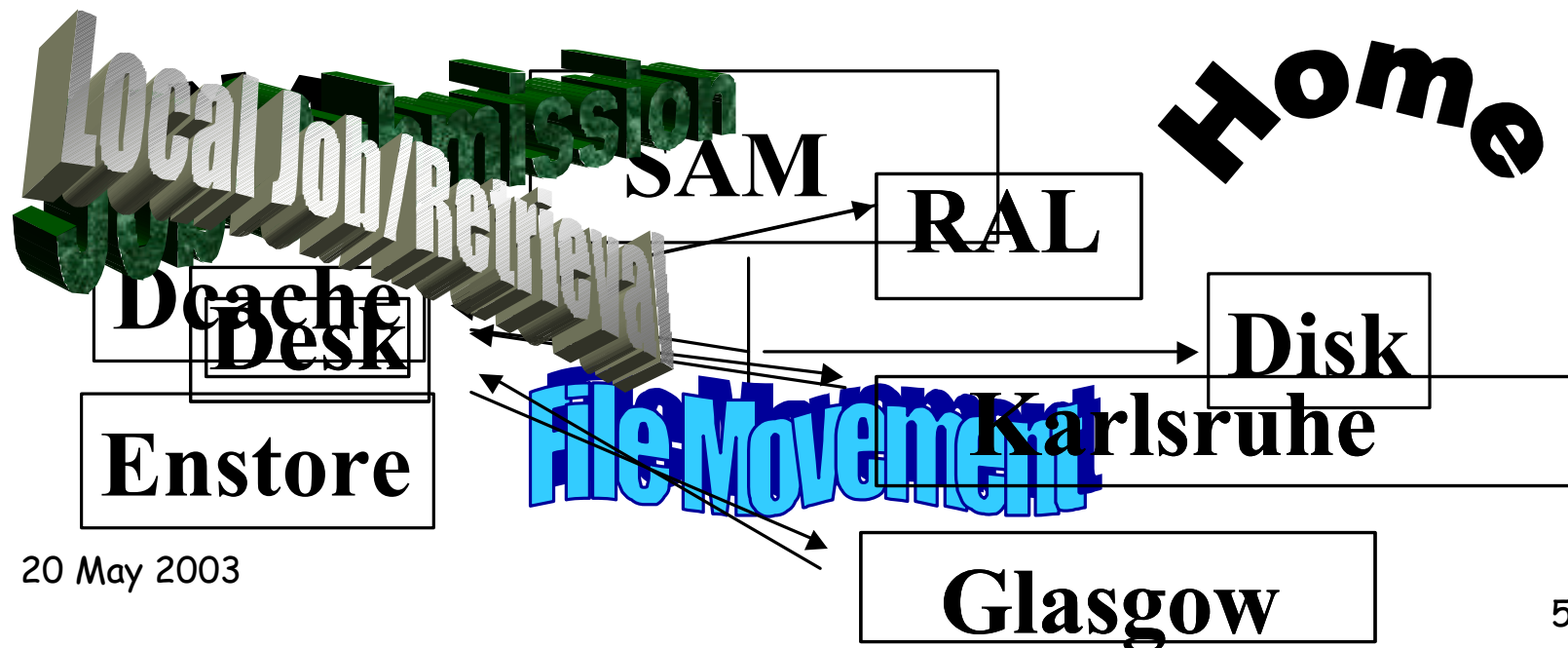
Goals Now

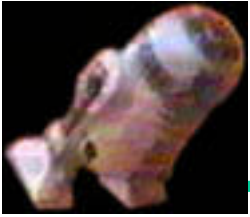


- Dcache for summer conference
Data Handling: transition physics groups from static datasets to DCACHE available "golden pools".
- Complete transition of dfc to sam: API (middle tier) work needed
 - prototype of procedure to transition to grid

The CDF DH Trident

- SAM: Data Catalog
- JIM: Global Batch Job Manager
- dCAF: Local Batch system





Offsite Needs: SAM does this NOW



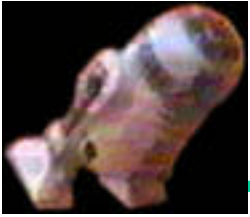
- Integrity Checking as files are transferred
- Robustness in event of network failure
- Adjustment for resources at FNAL being used by remote sites
- Firewalls and NAT access
- State of the Art Authentication for access
- Retrieval of datasets



Examples Now



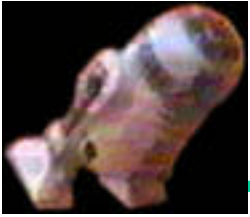
- 5 pc's with 20-30 Gig each make a 100 G cache. Can debug some datasets, accessing any (including raw data) up to keeping 100 files around. Desktops at FNAL; INFN
- Farm of PC's (10-20 at Oxford, Karlsruhe) with TB of disk nfs mounted, pc's use NAT to access FNAL, loading datasets and running from Dcache.



Joint Projects: DØ Responds to CDF



- Getting SAM to meet the needs of DØ in the many configurations is and has been an enormous challenge. Some examples include...
 - **File corruption issues.** Solved with CRC.
 - **Preemptive distributed caching** is prone to race conditions and log jams. These have been solved.
 - **Private networks** sometimes require "border" naming services. This is understood.
 - **NFS shared cache configuration** provides additional simplicity and generality, at the price of scalability (star configuration). This works.
 - **Global routing** completed.
 - **Installation procedures** for the station servers have been quite complex. They are improving and we plan to soon have "push button" and even "opportunistic deployment" installs.
 - **Lots of details** with opening ports on firewalls, OS configurations, registration of new hardware, and so on.
 - **Username clashing issues.** Moving to GSI and Grid Certificates.
 - **Interoperability with many MSS.**
 - **Network attached files.** Sometimes, the file does not need to move to the user.



Ongoing Projects



- Short Range: What we expect by end 2003
 - Getting SAM as CDF's DH system
 - SAM/JIM deployment
- Long Range: Going into the next 2 years
 - Grid Operations
 - Fuse DCACHE/SAMCACHE
 - Review of Code during migration
 - Implementation of resource models
 - Implementation of SAM features in Grid, Grid/sam common migration a la DFC/SAM
 - Security
 - Industry cooperation(SBIR)
- Resources
 - Manpower Resource Management

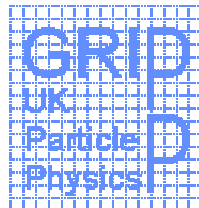
20 May 2003

Objectives of SAM-Grid

- JIM (Job and Information Management) complements SAM by adding job management and monitoring to data handling.
- Together, JIM + SAM = SAM-Grid
- Bring standard grid technologies (including Globus and Condor) to the Run II experiments.
- Enable globally distributed computing for DØ and CDF.

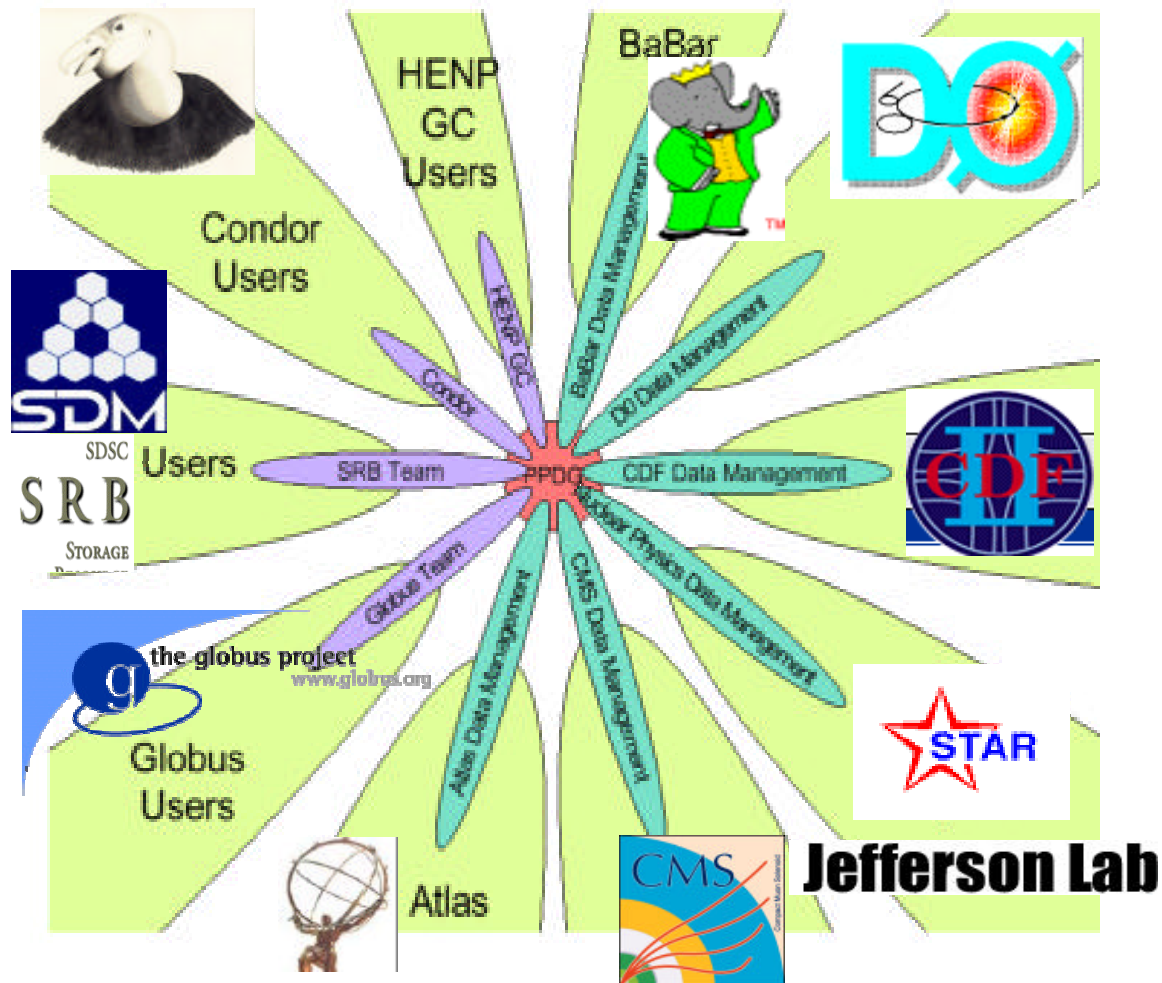


20 May 2003

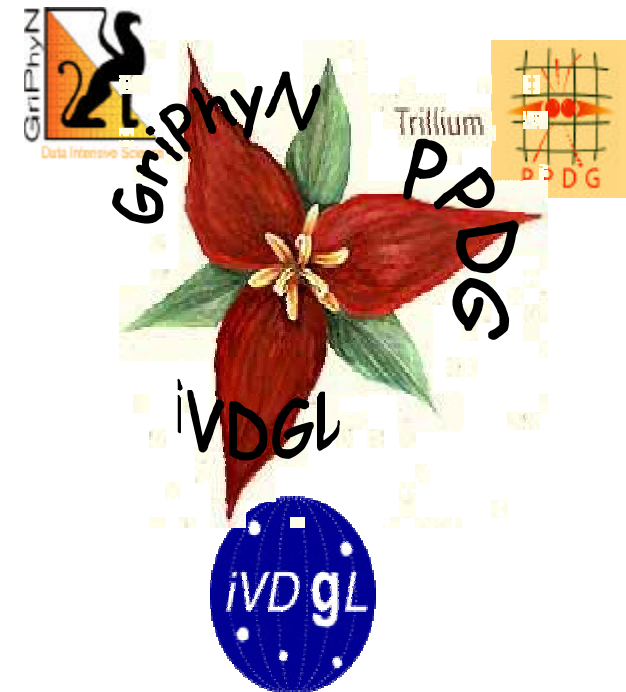


Projects Rich in Collaboration

PPDG



Trillium



20 May 2003



Production SAM/dCaf/JIM



1. To run like the SC2002 Demo
2. Have the firewall problem overcome (dCAF problem)
3. To run physics analysis
4. To run production with storage to tape at fnal
5. To run stripping with storage to tape at fnal
6. To run Monte Carlo with storage to tape at fnal
 - Frank's priorities: 162345
 - Jeff's priorities: 126354
 - Belforte 6. significant MC by end of year

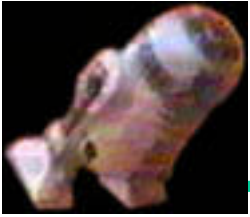


JIM Deployment



Station	Uni	Items	Cpu	Disk	Admin	Share	Date
Oxford	Ox	1-6	20	7TB	Stonjek		5/31
Scotgrid2	Gla	1-6	128	7TB	BurgonLyon	20%	5/31
Glasgow	Gla	1-6	28	*	BurgonLyon	All	5/31
Sam	Fnal	1-6	60	2TB	St.Denis	Most	5/31
Trieste	Infn	6			Belforte	Italy	12/31
Toronto	Tor				Tafirout		5/31
Fzkka	Karls				Kerzel		5/31
Knu	Kor	1,6	12		Oh		
Ttu	Tt		8	3TB	Sill		5/31
Ucsd	Ucsd						

ED May 2003



Short Range Milestones



AC++ running reliably on TestCAF: 20TB test	6/1/03
JIM production at limited sites	6/1/03
AC++ on CAF (After Summer Conference)	9/1/03
MC Storage with AC++/SAM: demonstration	6/1/03
MC Production with AC++/SAM	10/1/03
CSL storage of metadata in SAM: demonstration	7/1/03
CSL storage of metadata in SAM: production	9/1/03
Farms storage of metadata in SAM: demonstration	7/1/03
Farms storage of metadata in SAM: production	9/1/03
JIM production at sites wanting JIM	10/1/03
CDF using SAM as basic DH system	10/1/03

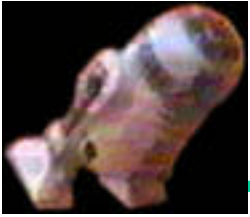
20 May 2003



Longer Term (next 2 years)



- Grid Operations
- Fusion With the Grid
- Cache Management (Dcache as example) - lots o'ideas in grid and no convergence
- Reviews of SAM/Grid Designs
- Resource Models: Who gets to use my cpu
- System Management with management software from Vendors : Is the Grid hopeless since we cannot manage the computers?
- Security
- Cooperation with Industry



Grid operations



- grow out of sam shifts at experiments
- controlled at tier 1 centers
- Stresses local manpower
 - ☞ Tier1 central monitoring according to subscription
 - Passive: provide tools for local monitoring
 - Active: subscription service. Commercial support for commercial users, Central Lab support for HEP.
- Distributed low level products (like Dcache):
 - options
 - ☞ Local monitoring
- Local implementation standardization and support
 - by major lab centers FNAL RAL CERN
 - ☞ - variety of packages for distribution with tailoring
 - ☞ - need to review the requirements satisfied by dcap, dccp, rootd, etc.



Fusion with Grid



- we know how to do this based on CDF/D0 join
 - we know how to test and deploy with running experiments: predator
 - work out a grid state diagram
 - identify overlapping functionality
 - ☞ data_tables, as in cdf/d0
 - ☞ add pluggins
 - ☞ specify in schema
 - define database as an abstract concept: JTrumbo&Co
 - Allow for implementation of a single virtual RDBMS in
 - ☞ XML, Spitfire, Oracle, msql, mysql, postgres
 - ☞ Specify the requirements that can be met by each
- List general requirements
- - Add SAM functionality to Grid: agreement to proceed this way with WP2 deputy-leader (data storage and management) and submitted for manpower funding on May 1 with Middleton/Clarke.
- 'build on experience gained in GridPP, EDG, and the running Tevatron experiments ...'



Sam and Grid



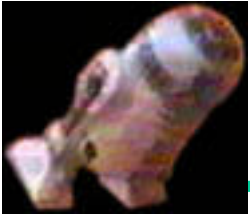
- from sam into grid
 - peer to peer
 - metadata query language: work with Helsinki and SBIR
Full integration of metadata
 - bookkeeping on projects run, operations on datasets
 - virtual datasets and virtual dataset management from
mc request of SAM
- fusion of sam and grid
 - base idea of file (crc etc) with plugin for specific
communities (determined by VO?)
 - We have learned the inbetween tables needed for a site-
local data management: see JTrumbo "piles of pc's to
smp's" and appropriate solutions.
 - grid optimization



Fuse with DCACHE/samCache management



- identify requirements of various caching needs vis-a-vis hardware
- implement cache to cache robustly
- UK searching for a mass storage support model (GridPP2 doc)
- write down development goals for each project and optimize overlap. ie. trailer dcache pool or sam? hierarchical dcache caches or sam caches: do we need a project fusion here?
- dcache root vs sam root
- root as transport



SAM Design Review



- Code rewrite for migration is an appropriate time for a design review.
- Will have new server code and code for distributed db another appropriate place for a design review.
- May require independent resources
- Need a sam state diagram -- or appropriate model of state machine with interrupt handlers.



Develop a resource model



Who Gets to use MY CPU?

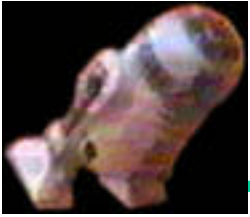
- left to local decision (Igor)
- pursue some models: contribution to aggregate/unit time guaranteed
- implement across grid
- test in cdf,d0 deployments: make d0 and cdf resource available to each other -- as well as LHC, BaBar etc.
- Project to combine cdf and scotgrid resources then nuclear physics and biologists:
 - Grid gets 20% and highest priority
 - Rest divided according to resources contributed.



system management and dispatch



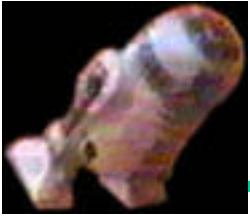
- - interaction with industry
 - dell / ibm: installed systems --- eventually installed sam/grid
 - - Scali Software
 - - Essential to maintain industrial competition and indeed stimulate it inasmuch as we can. Support sole-source-prevention/multiple competitors



Security



- - essential to integrity of grid
 - drive by needs of user for security
 - note on illegal uses
 - model of
 - ☞ policing (PROactive not Reactive)
 - ☞ reasonable expectations from users
 - ☞ standardized destandardization:
bbftp cookies in ups tailor at each site
 - allocation of systems with fast hack recovery: treat like a DB backup.



Security Meeting: Agenda and Goal



- Needs of experiments
 - CDF and D0
 - CMS
 - Suggestion on JIM
- Formal requirements
 - DOE absolute requirements
 - Fermilab Enhancements
- Reconciliation of the above points

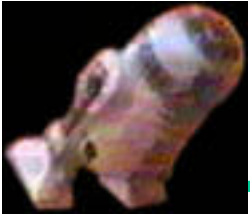
The goal of the briefing is to understand the security needs of the first SAMGrid deployments to the demo stage.; to understand whether the proposed SAMGrid security model would meet those needs;to understand what work remains to be done for SAM, JIM, and Grid tool providers to implement the model, and to understand any broader concerns and implications for the security and grid communities.



SBIR



- Model of how to work with business
- Thoughts: licensing is hard to handle
 - How do we collaborate with EDG if CDF/DO have license.
 - How do we expand to Grid usage
 - Plan seems ambitious: basically heterogeneous multi-master replication. Should coordinate closely with Jtrumbo&Co.
 - Overlaps strongly with GridPP: need collaboration but need to preserve commercial aspects
 - ☞ Commercial the support, monitoring and documentation.
 - ☞ Documentation can be distributed with certain licensing agreement



Development Projects



- Core SAM: Sinisa
- Core JIM: Igor
- Code review jimk/markp
- university vendor computing : morag burgon-lyon
- test models of allocation of resources: morag burgon-lyon
- test harnesses: Art and charlie
- distribution of code: Art and Charlie
- Distributed DB: J Trumbo & Gavin
- DCache and caching: Rob, Don, Jon
- Low level system productization: Don,Jon
- Software models; Rob Kennedy
- Security: Rick, Wyatt, Dane, Michael
- Sam&Jim deployment: igor,gabriele w/Wyatt, Rick
- Comp Resource Models: Morag BL, Rick, Igor
- FTE Resource Model, evaluation and task Assignment: Rick, Wyatt/ Gavin
- Industrial Development: Vicky&

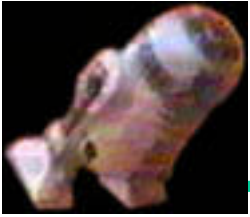
20 May 2003



BroadBrush Timeline for Sam/Grid



Fuse DCACHE/SAMCACHE	June 2004
Review of Code during migration	June 2003
Implementation of Resource Models	Sept 2003
Sam features in Grid	Sept 2004
Testing SAM in Grid	Sept 2004



Manpower resource management



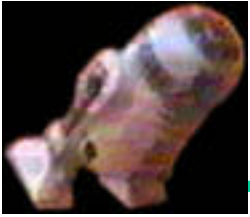
- resource definition
 - resource requirements
 - resource monitoring
 - resource reliability ratings
 - assign projects according to perceived reliability
 - what can we learn from glue on this: a model for how to manage
 - the various milestones and agenda of the constituent projects when forming a joint project.
- ==> what has glue to do with it:



Managment



- R2D2: Run II Data Handling and Data Reduction Committee.
 - Joint D0/CDF, Vicky White Convenes
 - Meet Every 2 weeks
- Formal Goals with FNAL
- Milestones agreed with GridPP
- MOU with university group
- MOU with FNAL (postdoc)



FTE Resources



- GridPP
 - Continuation of present posts
 - New posts for integration with Grid (GRidPP2 middleware)
 - New posts for experimental support (software to run on Grid)
- FNAL/PPDG
 - Jim Team
 - Core Sam
 - CDFDept, D0 Dept
 - CEPA, CCF
 - Postdocs
 - SBIR
- CDF Collaboration (non-gridpp)
 - Karlsruhe
 - Finland
 - Texas
 - UCSD
 - Toronto

20 May 2003



GridPP2(bid for 5fte) tasks



- Metadata: fuller integration of application meta-data into the data management software, development of existing software
- Site local data management (nb DCACHE)
- (UK) Mass Storage systems and architectures
- Grid Optimization (plug into SAM/JIM)
- Virtual Data (SAM MC)



GridPP2 deliverables/milestones relevant to RunII



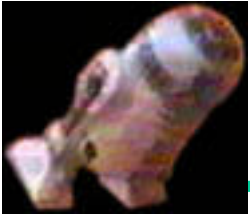
- month 3
 - Evaluation of factorizability of SAM design with plans for adaptation of Grid features in SAM and extraction of SAM features to the Grid
 - Evaluation of Chimera and of SAM MC systems
- month 6
 - Aid FNAL exp with mod of SAM for testing with Grid compliance
- month 9
 - Cut of SAM design into Grid
 - aid fermilab in demonstration of functionality of sam in grid through use of predator 2
- month 15
 - work with Fermilab experiments to bring the SAM/Grid scheme into production
 - Incorporation of the Optimization module in SAM/JIM



GridPP2 SAM-related Milestones



- month 18
 - - Inclusion of modifications to OptorSim driven by comparison to Tevatron data handling
- month 24
 - Continue work to eliminate distinctions of functionality between SAM and Grid.
- Note: need to ensure the intellectual credit does not get lost in the exchange.



Conclusions



- SAM is a significantly better product with cataloguing that allows private datasets to be made, describe how they were made and to be exchanged
- JIM will allow CAF-GUI like submission to all CDF institutes willing to participate
- dCaf gets the jobs running and back to you
- Desktop and farm services to read data available now
- MC storage by October
- Expansion to Grid and Tools Common with LHC will make the transition technically easier
- Using the Grid for CDF will benefit CDF with advanced tools and manpower resources and will benefit CDF collaborators that will do LHC with a working tool for that era.